AMERICAN FORK CITY
GENERAL PLAN

Public Facilities and Services Element

2018 Culinary Water System Master Plan
&
Impact Fee Facility Plan

John E. Schiess, P.E.

LICENSED PROFESSIONAL ENGINEER
JOHN E. SCHIESS
264134
11/21/2018
ELECTRONIC SEAL
STATE OF UTAH

Digitally signed by John E. Schiess, P.E.
DN: C=US, E=jschiess@horrocks.com, O=Horrocks Engineers, OU=Principal, CN="John E. Schiess, P.E."
Date: 2019.02.11 11:57:28-07'00'

Prepared by

HORROCKS ENGINEERS

ORDINANCE NO. 2018-11-48

AN ORDINANCE ADOPTING A CULINARY WATER SYSTEM PLAN, PRESSURIZED IRRIGATION SYSTEM PLAN, SANITARY SEWER SYSTEM PLAN, AND A TRANSPORTATION SYSTEM PLAN AS AN AMENDMENT TO THE PUBLIC FACILITIES AND SERVICE ELEMENT OF THE AMERICAN FORK GENERAL PLAN.

WHEREAS, Section 10-9a-401(1) Utah Code Annotated (1953, as amended) requires each municipality in the State of Utah to prepare and adopt a comprehensive, long range general plan for: (a) present and future needs of the municipality; and (b) growth and development of the land within the municipality; and

WHEREAS, Section 10-9a-403, Utah Code Annotated (1953, as amended) recommends and describes the general content of each of the major elements typically included within a general plan, including, but not limited to, a public services and facilities element showing general plans for water, sewage drainage, and similar utilities; and

WHEREAS, the City has heretofore authorized the preparation of a study for the purpose of revising the prior culinary water system plan, pressurized irrigation system plan, sanitary sewer system plan, and transportation system plan, which revised plan should include (1) recommendations for improvement to the existing systems and (2) recommendations for construction of a said systems with the City as a means of providing services to City residents; and

WHEREAS, the Planning Commission, with the assistance of consultants and City staff personnel, have reviewed the results of the study and received a written report setting forth the major findings, precepts and recommendations for improvement of existing systems and development; and determined that the proposed improvements to the existing systems as recommended in the report, is feasible and in the best interests of the residents; and

WHEREAS, the Planning Commission has reviewed the report, advertised and held a public hearing thereon, duly considered the comments received at the public hearing, and acted to recommend approval to the City Council, all in accordance with Utah State Laws; and

WHEREAS, the City Council has received the recommendation from the Planning Commission, and duly considered the report, the recommendations from the Planning Commission and comments from the public.

NOW THEREFORE BE IT ORDAINED BY THE CITY COUNCIL OF AMERICAN FORK CITY, UTAH:

SECTION 1. That certain documents entitled "American Fork City General Plan Public Facilities and Services Element 2018 Culinary Water System Master Plan & Impact Fee Facility Plan," "American Fork City General Plan Public Facilities and Services Element 2018 Pressurized Irrigation System Master Plan & Impact Fee Facility Plan", "American Fork City General Plan Public Facilities and Services Element 2018 Sanitary Sewer System Master Plan & Impact Fee Facility Plan" and "American Fork City Transportation Element of the General Plan" together will all charts, maps, plans and descriptive and explanatory

material contained therein, prepared by Horrocks Engineers, dated August 2018, are hereby adopted as amendments to the Public Facilities and Services Element of the General Plan of American Fork City.

SECTION 2. It is the express intent of the City Council that, to the extent possible, said plan shall be followed, complied with, and otherwise adhered to.

SECTION 3. The Planning Commission and City Staff are hereby directed to recommend such ordinances and policies as are recommended under the plan and deemed essential for its implementation.

SECTION 4. This Ordinance shall take effect upon its passage, as provided by law.

PASSED AND ADOPTED THIS 13 DAY OF NOVEMBER, 2018.

Bradley J. Frost, Mayor

ATTEST:

Terilyn Lurker, City Recorder

AMERICAN FORK CITY CORPORATE SEAL UTAH COUNTY STATE OF UTAH

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Abbreviations

AAPR	Annual Percentage Growth Rate
CCI	Construction Cost Index
ERC	Equivalent Residential Connection
DDW	Division of Drinking Water
fps	Feet per Second
gpd	Gallons per Day
gpdpc	Gallons per Day per Capita
gpm	Gallons per Minute
IFA	Impact Fee Analysis
IFFP	Impact Fee Facility Plan
sf	Square Foot

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Chapter 1 - Summary and Recommendations

Introduction

American Fork City has been experiencing significant population growth over the past several years, with many new subdivisions having been built and large blocks of land having been annexed into the City. The City continues to prepare for additional population growth, especially in areas south of Interstate 15 such as the proposed Transit Oriented Development (TOD) area. Due to these factors, it is necessary to review and update the American Fork City culinary water system component of the General Plan to help the City prepare for growth and to correct water system deficiencies.

Horrocks Engineers prepared the American Fork City Water Systems component of the General Plan in 1993, which was subsequently updated in 1998. An additional section was added to the water systems component of the General Plan in 2003, which was then updated in both 2007 and 2010 to include the proposed secondary water system, hereafter referred to as the pressurized irrigation system. Since completion of construction of the pressurized irrigation system in 2010, demands on the culinary water system have been significantly reduced and overall water service to City residents has improved. The pressurized irrigation and culinary water systems generally operate independent of each other. As such, the American Fork City Water Systems component of the General Plan was separated into the Culinary Water and Pressurized Irrigation System master plans in 2016.

Most of the recommendations in the previous components have been completed. This 2018 Culinary Water System master plan update addresses the changes since 2016. This study was performed assuming the city-wide pressurized irrigation system will supply the majority of outdoor water demand.

American Fork City's current and future conditions are discussed in this study, including the existing land use and zoning, projected population, number of connections, developable areas, and projected demand. Using the projected population, design requirements, and historical demand, required system capacity is projected through the planning period.

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service (LOS) to be provided by the culinary water system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Provide 20 psi at all locations in the distribution system during a fire flow event.

- Provide minimum 1,750 gpm of fire flow for 2 hours (adequate for 4,800 sf home).
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 400 gallons of storage per ERC
- Maintain a minimum of 0.45 ac-ft of water right per ERC
- Maintain a minimum of 0.56 gpm of water source per ERC

The International Fire Code (UFC) requires that a minimum fire flow of 1,750 gpm at 20 psi residual pressure be available for homes greater than 3,600 square feet. For homes less than 3,600 square feet, the required fire flow is 1,000 gpm. Homes that are 4,800 square feet and larger require increasingly larger fire flows. It is recommended that homes greater than 4,800 square feet should be analyzed individually to determine if adequate fire flows are available and what improvements are necessary to obtain adequate fire protection.

A computer program was used to analyze the existing water systems to determine if the LOS pressures and fire flows could be met. The capital improvements required to bring the existing water system up to the minimum LOS were also determined. In addition, recommendations for improvements were made to meet future demand.

The feasibility of the recommended improvements depends on the available funding. Recommendations are made to provide the funding needed to implement the recommended capital improvements.

Projected Population

American Fork City's population as of 2018 was 35,607 people. However, the City's population is projected to increase by 132 percent to 86,694 people at build out conditions by the year 2060. This growth will add an additional 18,424 equivalent residential units (ERCs) to the system.

Projected Water Demand

Calculations in this report assume that the culinary water system is used for most indoor water use and the pressurized irrigation system is used for most outdoor water use. It is also assumed that all residents connected to the pressurized irrigation system use the system for their outdoor watering needs. Indoor water use records were analyzed to determine average water usage by a residential home for this study.

The State of Utah Division of Drinking Water has minimum **peak day** source requirements of 800 gallons per day (gpd) per connection for indoor use. Actual water use data from 2014 individual user meter readings shows an **average usage day** of 208 gpd per residential connection was used. Peak day individual meter usage is typically twice the average. This data was utilized to determine ERC values for all non-residential uses. In order to calibrate the model the total system peak usage day was estimated from monthly totals delivered to the system from the City's culinary water source master meters. The average flow in the peak month was multiplied by a peaking factor of 1.2 to come up with the peak day. American Fork City does not

track water sources on a daily basis but daily measurements in an adjoining community suggest a peaking factor between 1.11 and 1.3. Based on the above assumptions, peak daily culinary demand per ERC is 718 gallons per day (gpd). The difference between the individual metered usage and master metered supply is due to leakage and loss. The amount of leakage and loss is more than anticipated and it is recommended the City attempt to determine the reasons and take steps to reduce. For modeling and planning purposes the DDW standard of 800 gpd (0.56 gpm) is utilized because that is required by State Code. This becomes the Level of Service (LOS) for both existing and future users.

Recommended Culinary Water System Improvements

These recommendations were determined by using a computer model of American Fork City's culinary water system and input from city staff.

Existing Deficiency Improvement Plan

Table 1 shows the deficiencies in the existing culinary water system. These improvements are shown in Figure 2 in the appendix. A portion of the improvements listed will serve future as well as existing connections and the proportion associated with each are shown.

Table 1 Existing Deficiencies

Item	Description	Cost	Existing	Growth
1	New 8 Inch Connections	$57,021	$24,521	$32,500.05
2	8 Inch Upsizing	$2,357,324	$1,013,725	$1,343,598.66
3	4 Inch Waterline Replacement	$16,238,007	$16,238,007	$0.00
4	Hospital Well Generator Replacement	$120,000	$120,000	$0.00
	Grand Total	**$18,772,352**	**$17,396,253**	**$1,376,099**

September 2018 CCI = 11170

Buildout Improvement Plan

Table 2 shows the projected improvements in the buildout culinary water system. These improvements are shown in Figure 3 in the appendix.

Table 2 Buildout Improvements

Item	Description	Cost
1	Buildout Distribution Piping	$34,967,798
2	Buildout Transmission Piping	$26,911,944
3	Southwest Well and Generator	$4,494,252
4	North East Well and Generator	$3,682,495
	Grand Total	**$70,056,489**

September 2018 CCI = 11170
Costs are in 2018 dollars

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Chapter 2 - Current and Future Conditions

Future conditions in American Fork City will affect the culinary water demands and the improvements needed to meet these demands. As factors change, the projected future conditions made in this study could be affected. To help minimize the effect of the changing future conditions, the recommendations made in this study have been based upon the number of people served by American Fork City's culinary water system rather than time periods.

This chapter discusses American Fork City's population projections through the planning and ultimate build-out periods. The projected number of culinary water connections has been determined based upon the projected population. In addition, using the potential areas of development, historical water demands, and State design requirements, the culinary water demands projected through the planning and ultimate build-out periods are discussed.

Projected Population

Population projections have been determined for American Fork City by Mountainland Association of Governments (MAG) in ten (10) year increments until total build-out is reached near the year 2060. However, the MAG population projections do not take into account the Transit Oriented Development (TOD) area located south of Interstate 15. Additional “high density” population projections have been determined by InterPlan in ten (10) year increments that take the TOD development into account. Intermediate numbers for both the MAG and InterPlan population projections were calculated by interpolation and are shown in Table 3. American Fork City's projected population is also shown on Figure 1. The projected average annual percentage growth rate (AAPR) from 2016 to 2060 is approximately 2.03 percent. Figures 5 and 6 in the appendix show the current zoning and anticipated land use within American Fork City.

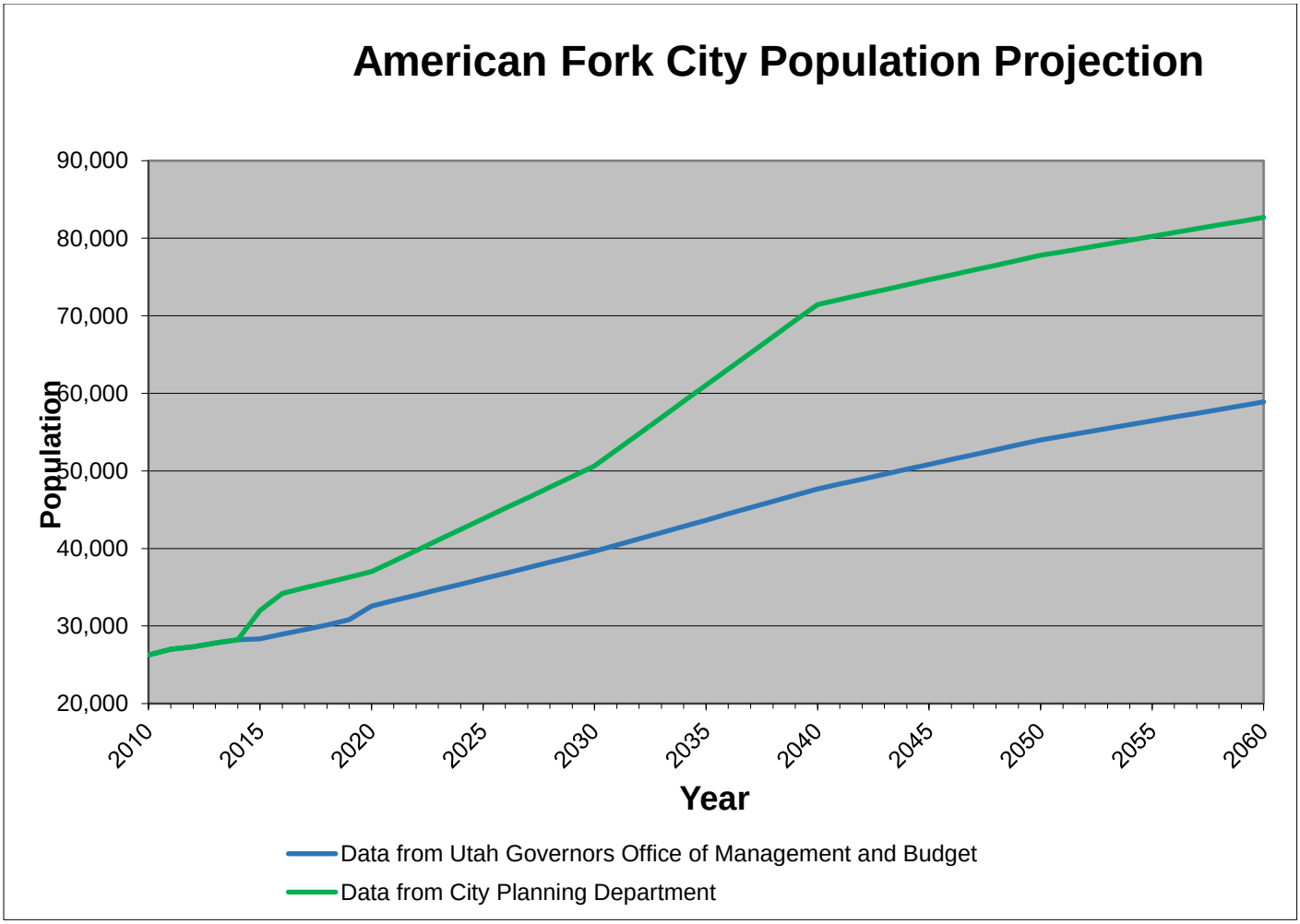

Figure 1 Population Projections

Equivalent Residential Connection (ERC)

Culinary water demands are generated from residential, commercial, industrial, and institutional sources and it is advantageous to relate these sources in a quantifiable manner. It was determined in the culinary water master plan that an average residential home in American Fork City required 208 gallons of culinary water per day. The average residential home is defined as an ERC. Other sources such as churches, schools, and commercial businesses are compared to the average residential home to determine its ERC value. For example a commercial business who requires 624 gallons of culinary water per day is assigned an ERC value of 3.0 because it requires three times the culinary water of an average home.

ERC's are anticipated to grow at the same rate as population. Table 3 also shows the projected ERC Growth.

Table 3 Population and ERC Projections

Year	Population	Growth Rate	ERC's
2016	34,213	6.92%	12,032
2017	34,910	2.04%	12,967
2018	35,607	2.00%	13,901
2019	36,303	1.96%	14,173
2020	37,000	1.92%	14,446
2021	38,364	3.69%	14,979
2022	39,727	3.55%	15,512
2023	41,091	3.43%	16,044
2024	42,454	3.32%	16,577
2025	43,818	3.21%	17,110
2026	45,181	3.11%	17,643
2027	46,545	3.02%	18,176
2028	47,908	2.93%	18,709
2029	49,272	2.85%	19,242
2030	50,635	2.77%	19,775
2031	52,719	4.12%	20,590
2032	54,802	3.95%	21,404
2033	56,886	3.80%	22,219
2034	58,970	3.66%	23,033
2035	61,054	3.53%	23,848
2036	63,137	3.41%	24,662
2037	65,221	3.30%	25,477
2038	67,305	3.19%	26,292
2039	69,388	3.10%	27,107
2040	71,472	3.00%	27,922
2041	72,104	0.88%	28,169
2042	72,736	0.88%	28,417
2043	73,369	0.87%	28,665
2044	74,001	0.86%	28,913
2045	74,633	0.85%	29,161
2046	75,265	0.85%	29,409
2047	75,897	0.84%	29,657
2048	76,530	0.83%	29,905
2049	77,162	0.83%	30,153
2050	77,794	0.82%	30,401
2051	78,284	0.63%	30,593
2052	78,774	0.63%	30,786
2053	79,264	0.62%	30,978

2054	79,754	0.62%	31,170
2055	80,244	0.61%	31,363
2056	80,734	0.61%	31,555
2057	81,224	0.61%	31,748
2058	81,714	0.60%	31,940
2059	82,204	0.60%	32,133
2060	82,694	0.60%	32,325

Existing Culinary Water System

The existing American Fork City culinary water system includes sources, storage, water rights, and distribution piping. The following sections describe the existing culinary water system components. The tables are a summary of the system as a whole rather than a zone specific analysis. A zone specific analysis has been performed with results shown in the Appendix. If there is a zone specific deficiency it is noted in the appropriate section.

Culinary Water Sources

Table 4 shows the City existing culinary water sources and their capacity. Table 5 shows the current need versus supply. American Fork City currently has excess culinary water sources. Actual water usage in the City is significantly less than state standards and therefore these sources may not be physically necessary for the culinary water system to operate. It is recommended that the City explore the possibility of obtaining a reduction in source requirement from the Division of Drinking Water. There is also the possibility that the State will revisit source water requirements and update them to match existing usage patterns associated with water conservation over the past 30 years.

Table 4 Existing Culinary Water Source Capacity

Water Source	Flowrate Capacity (gpm)	Pressure Zone
Boley Well	2,668	Upper Zone
Country Club Well	2,588	Upper Zone
Golf Course Well	2,660	Lower Zone
Hospital Well	1,400	Lower Zone
J.C. Park Well	1,500	Lower Zone
Race Track Well	3,200	Upper Zone
AF Canyon Springs	1,800	Upper Zone
Totals	**15,816**	

Table 5 Existing Culinary Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	7,785	15,816	8,031

Culinary Water Storage

Table 6 shows the City's existing culinary water storage facilities and their capacity. Table 7 shows the current need versus supply. American Fork City currently has excess culinary water storage.

Table 6 Existing Culinary Water Storage Capacity

Tank	Capacity (gallons)	Zone*
AF Canyon Tank #1	5,000,000	Upper Zone
AF Canyon Tank #2	5,000,000	Upper Zone
Tank Farm (1 Tank)	4,500,000	Lower Zone
AF Canyon Springs Equivalent *	216,000	Upper Zone
Hospital Well Equivalent *	168,000	Lower Zone
Total	14,884,000	

*Free flowing springs or wells with backup power can be considered storage over the two hour fire flow period.

Table 7 Existing Culinary Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Current	5,980,400	14,884,000	8,903,600

Culinary Water Rights

Table 8 shows the City's existing water rights. Table 9 shows the current need versus supply. American Fork City currently has adequate water right capacity. See City 40-Year water rights plan for details on water rights.

Table 8 Existing Water Right Capacity

Water Source	Water Right Capacity (ac-ft)	Pressure Zone
	Adequate	
Totals	**Adequate**	

Table 9 Existing Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	6,255	Adequate	Adequate

Culinary Distribution Piping

Figure 6 in the appendix shows the City's existing distribution system including piping, sources, storage, etc. Figure 7 shows the pressure zones within the culinary water system.

Projected Culinary Water System Requirements

The projected population and LOS requirements were used to project the culinary water needs through the planning period. Using the projected ERCs, Table 10 shows the projected source, storage, and water right needs through the planning period. The tables are a summary of the system as a whole rather than a zone specific analysis. A zone specific analysis has been performed with results shown in the Appendix. If there is a zone specific deficiency it is noted in the appropriate section.

Table 10 Projected Culinary Water Needs

Year	ERC's	Flow Required (gpm)	Storage Volume Required (gallons)	Water Rights Required (ac-ft)
2018	13,901	7,785	5,980,400	6,255
2019	14,173	7,937	6,089,379	6,378
2020	14,446	8,090	6,198,364	6,501
2025	17,110	9,582	7,264,092	7,700
2030	19,775	11,074	8,330,145	8,899
2035	23,848	13,355	9,959,136	10,732
2040	27,922	15,636	11,588,623	12,565
2045	29,161	16,330	12,084,371	13,122
2050	30,401	17,024	12,580,272	13,680
2055	31,363	17,563	12,965,173	14,113
Buildout	32,325	18,102	13,350,193	14,546

Buildout Culinary Water Sources

Table 11 shows the buildout need versus supply. It is projected that American Fork City will have inadequate culinary water sources at buildout. This is a change from earlier master plans in that proposed high density development have increased the potential needs significantly. It is recommended that two new wells be constructed one each in the Lower and Upper Zones. The City should also closely monitor the status of the aquifer to see if it maintains the necessary levels to supply the water necessary at buildout. Existing wells may need to be deepened or re-drilled as aquifer water levels continue to decrease. If aquifer water levels decrease too much then other sources of drinking water may need to be obtained such as treating surface water to drinking water quality.

Table 11 Buildout Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	18,102	15,816	(2,286)

Buildout Culinary Water Storage

Table 12 shows the buildout need versus supply. It is projected that American Fork City will have adequate culinary water storage at buildout. It is also recommended to have a 20 percent excess reserve if possible.

Table 12 Buildout Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Buildout	13,350,193	14,884,000	1,533,807

Buildout Culinary Water Rights

Table 13 shows the buildout need versus supply. It is projected that American Fork City will have inadequate culinary water rights at buildout. It is recommended that the City continue to require water rights to be turned in to the City as a condition of development. Water rights that the City accepts should have a priority date of 1950 or earlier. This is based on the area water rights being over allocated. See City 40-Year water rights plan for details on water rights.

Table 13 Buildout Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	14,546	Inadequate	Inadequate

Zone by Zone Analysis

A zone by zone analysis of culinary water system needs is given in the appendix. It shows the source, storage, and water right needs for each pressure zone in the culinary water system both for existing and buildout. It also shows the exiting ERC's and projected buildout ERC's in each zone. Figure 7 in the appendix shows the culinary water pressure zones for American Fork City

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Chapter 3 – Culinary Water System Analysis

American Fork City's culinary water system was analyzed to find the capacity of the current system and to determine the improvements needed to meet the demands of the projected population. In this chapter, a description of the existing culinary water system is given along with a discussion of the concerns and recommended improvements. State and American Fork City standard requirements were used as criteria to analyze the culinary water system. Information obtained from a computer model of American Fork's culinary water system is presented with the recommended improvements needed to meet the projected population culinary water demand.

American Fork City currently has approximately 158 miles of culinary water pipelines that transmit and distribute culinary water throughout the City. Figure 6 in the appendix shows the existing culinary water system. Pipelines in the City range from 2 inches to 24 inches.

State Design Requirements

The Utah DDW provides regulations for culinary water system design. It is recommended that American Fork City adopt the following criteria as the minimum level of service for the culinary water system:

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service to be provided by the culinary water system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Provide 20 psi at all locations in the distribution system during a fire flow event.
- Provide minimum 1,750 gpm of fire flow for 2 hours (adequate for a 4,800 sf home).
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 400 gallons of storage per ERC
- Maintain a minimum of 0.45 ac-ft of water right per ERC
- Maintain a minimum of 0.56 gpm of water source per ERC

The Uniform Fire Code (UFC) requires that a minimum fire flow of 1,750 gpm at 20 psi residual pressure be available for homes greater than 3,600 square feet. For homes less than 3,600 square feet, the required fire flow is 1,000 gpm. Homes that are 4,800 square feet and larger require increasingly larger fire flows. It is

recommended that homes greater than 4,800 square feet should be analyzed individually to determine if adequate fire flows are available and what improvements are necessary to obtain to obtain adequate fire protection.

Computer Model of Culinary Water System

A computer program called *WaterGEMS* (Connect Edition Update 1) was used to model American Fork City's culinary water system. The program uses the flows demanded at each node to calculate the pressures, flows, and velocity of flow for each node and pipe. Output of the model includes, pipe velocity, node demands, pressures, and available fire flow. Information for the existing culinary water system includes the pipe diameters, lengths, tanks, sources, pumps, PRV stations, etc.

The number of ERCs was estimated based on build-out conditions with the 2016 zoning and assuming 20 percent of the area was used in the development of roadways, sidewalks, parks, etc. The flows generated by the number of ERCs achieved at build-out were entered into *WaterGEMS*. *WaterGEMS* was run to determine upgrades needed for demands on the existing culinary water system and demands to be placed on the system during buildout.

Division of Drinking Water Hydraulic Modeling Rule

The hydraulic modeling was performed in conformance with the State of Utah Administrative Code R309-511. Hydraulic Modeling Requirements and utilized the minimum flow requirements of R309-510 and the minimum pressure requirements of R309-105-9. All recommendations within this plan are to ensure that both the existing and buildout system meet the standards noted above. The hydraulic model was calibrated with field measurements and observations including fire flow testing in each of the separate pressure zones. The majority of the fire flow tests were within 5 percent of the modeled results. It was determined that the areas that showed greater than 5 percent discrepancy were caused by closed valves. These valves are in the process of being located and opened.

Existing Deficiency Improvement Plan

Table 14 shows the deficiencies in the existing culinary water system. These improvements are shown in Figure 2 in the appendix. A portion of the improvements listed will serve future as well as existing connections and the proportion associated with each are shown. Figures 8 and 9 in the appendix show the existing peak day pressure and velocity respectively. Figure 10 in the appendix shows the current available fire flow.

Table 14 Existing Deficiencies

Item	Description	Cost	Existing	Growth
1	New 8 Inch Connections	$57,021	$24,521	$32,500.05
2	8 Inch Upsizing	$2,357,324	$1,013,725	$1,343,598.66
3	4 Inch Waterline Replacement	$16,238,007	$16,238,007	$0.00
4	Hospital Well Generator Replacement	$120,000	$120,000	$0.00
	Grand Total	**$18,772,352**	**$17,396,253**	**$1,376,099**

September 2018 CCI = 11170
Costs are in 2018 dollars

Buildout Improvement Plan

Table 15 shows the improvements necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix. Figure 11 in the appendix shows the proposed buildout water system. Figures 12 and 13 in the appendix show the projected peak day pressure and velocity respectively at buildout. Figure 14 in the appendix shows the projected available fire flow at Buildout.

Table 15 Buildout Improvements

Item	Description	Cost
1	Buildout Distribution Piping	$34,967,798
2	Buildout Transmission Piping	$26,911,944
3	Southwest Well and Generator	$4,494,252
4	North East Well and Generator	$3,682,495
	Grand Total	**$70,056,489**

September 2018 CCI = 11170
Costs are in 2018 dollars

A summary of the recommended improvements, scheduling, and estimated costs is shown in Table 16. Figures 2 and 3 in the appendix shows the recommended improvements. With contingencies, engineering, legal, and administrative fees, the total estimated cost is $189,390,005.

Table 16 Full Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2018-19	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	New 8 Inch Connections	$57,021	43.00%	$32,500	$24,521
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,483,103	0.00%	$1,483,103	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2019-20	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,483,103	0.00%	$1,483,103	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2020-21	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,528,046	0.00%	$1,528,046	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2021-22	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	Hospital Well Generator Replacement	$120,000	100.00%	$0	$120,000
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2022-23	5 Year Master Plan Update	$40,000	43.00%	$22,799	$17,201
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2023-24	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0

	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2024-25	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2025-26	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2026-27	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2027-28	5 Year Master Plan Update	$40,000	43.00%	$22,799	$17,201
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2028-29	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	System Replacement	$2,826,202	100.00%	$0	$2,826,202
	North East Well and Generator	$1,841,247	0.00%	$1,841,247	$0
2029-30	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	System Replacement	$2,826,202	100.00%	$0	$2,826,202
	North East Well and Generator	$1,841,247	0.00%	$1,841,247	$0
2030-35	Annual Master Plan Review	$56,000	43.00%	$31,918	$24,082
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
	Buildout Distribution Piping	$5,504,190	0.00%	$5,504,190	$0
	Buildout Transmission Piping	$4,983,693	0.00%	$4,983,693	$0
2035-40	Annual Master Plan Review	$56,000	43.00%	$31,918	$24,082
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
	Buildout Distribution Piping	$5,504,190	0.00%	$5,504,190	$0
	Buildout Transmission Piping	$4,983,693	0.00%	$4,983,693	$0
2040-45	Annual Master Plan Review	$56,000	43.00%	$31,918	$24,082
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
	Buildout Distribution Piping	$5,504,190	0.00%	$5,504,190	$0
	Buildout Transmission Piping	$4,983,693	0.00%	$4,983,693	$0

2045-50	Annual Master Plan Review	$56,000	43.00%	$31,918	$24,082
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
	Buildout Distribution Piping	$5,504,190	0.00%	$5,504,190	$0
	Buildout Transmission Piping	$4,983,693	0.00%	$4,983,693	$0
2050-55	Annual Master Plan Review	$56,000	0.00%	$56,000	$0
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
2055-60	Annual Master Plan Review	$56,000	43.00%	$31,918	$24,082
	System Replacement	$14,131,011	100.00%	$0	$14,131,011
	Total Expenditures	**$189,390,005**		**$71,716,575**	**$117,673,430**

Utah State Training School

The State of Utah owns and operates the Training School in the northeast portion of the City. The waterlines serving the training school are included in the map and modeling of this master plan but are owned and maintained by the State. They are undersized and need to be updated to meet the current fire flow requirements. They are older and likely leaking as well. An analysis a few years ago noted a significant difference between the water metered into the Training School versus the amount of flow leaving in the sanitary sewer. It is recommended that the City notify the Training School of the inadequacy of the waterlines serving their facility.

Ground Water Aquifer

The City obtains a majority of its culinary water from wells that tap the ground water aquifer in North Utah County. This percentage will increase as the City builds out. Previous master planning has estimated that the ground water aquifer would meet the needs of the buildout City especially with the construction of the City wide pressurized irrigation system in 2008-2010. Since that time there has been increased pressure for high density development and hence increased culinary water demand. There has also been increased pressure on the aquifer from growth throughout North Utah County. In recent years the State Engineer has determined that the water rights in North Utah County have been over allocated meaning there are more water rights issued to water users than the aquifer can support. The last five years have been significant drought years as well and aquifer water levels are dropping significantly. All of these issues lead us to be cautious in projecting that all future culinary water needs will be met by tapping the ground water aquifer. Meeting the culinary needs of the future for the City will likely require a combination of efforts.

The City should actively pursue and participate in aquifer storage and recovery (ASR) efforts. ASR is the active encouragement of ground water infiltration during times of excess surface water flows. This water can be pumped out of the aquifer later in times of need. It is recommended that the City continue to be active in the North Utah County Aquifer Association and budget the necessary funds to implement its recommendations regarding ASR.

The City should also continue to implement water conservation measures. Over the past 30 years improvements in plumbing and water conservation education have decreased per capita culinary water use significantly. These efforts should continue and be enhanced where possible.

The proposed annual water system replacement program whereby old failing culinary water infrastructure is replaced will help conserve water lost to leaks and breakages. The City should continue its leak detention program as well.

At some point in the future it is entirely possible that the ground water aquifer will not fully meet the City culinary water needs despite all the City's and others best efforts to conserve, protect and enhance the aquifer. It may be necessary to treat surface water sources to culinary standards to meet the future needs of the City. The likely sources of water for treatment are American Fork River water and Provo River water deliver through aqueducts near the north east corner of the City. With this in mind the recommended buildout improvements shown in this master plan include a large transmission line from the northeast corner of the City to South of I-15 near the Front Runner station and the proposed high density development there. This large transmission serves equally well if the aquifer can meet the City's future culinary needs or if water treatment becomes necessary.

Culinary Water System Replacement

American Fork City's culinary water system was constructed over the past 80 years or so and some areas are reaching their design life and/or may be failing. It is recommended that American Fork City begin to budget for system replacement every year so as facilities fail and need to be replaced there will be sufficient funds to do so. Current budgeting includes depreciation on existing infrastructure and these funds could be utilized to replace failing infrastructure. Table 15 shows the existing culinary water system total replacement costs. If the City were to replace the whole system over an 80 year period the yearly costs would be approximately $2,826,202.

Table 17 Existing Culinary System Replacement Cost

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$8,218,691
2	4, 6, & 8 inch DIP	608,321	LF	$64.18	$39,040,193
3	10 inch DIP	48,053	LF	$69.53	$3,340,887
4	12 inch DIP	102,513	LF	$80.22	$8,223,716
5	14 inch DIP	3,774	LF	$96.27	$363,306
6	16 inch DIP	19,241	LF	$117.66	$2,263,853
7	18 inch DIP	34,132	LF	$149.75	$5,111,139
8	20 inch DIP	6,232	LF	$192.53	$1,199,852
9	22 inch DIP	1,057	LF	$224.62	$237,423
10	24 inch DIP	9,234	LF	$256.71	$2,370,440
12	Fire Hydrants	1,850	EA	$6,029.25	$11,154,107
13	Service Connections	10,400	EA	$1,705.74	$17,739,709
13	PRV Stations	7	EA	$73,943.78	$517,606
13	Water Supply Wells	6	EA	$2,460,116.82	$14,760,701
13	Spring Collection System	2	EA	$427,846.40	$855,693
13	Chlorine Injection Station	1	EA	$267,404.00	$267,404
13	Storage Tanks	15	MG	$995,409.72	$14,931,146
17	Class "A" Road Repair	4,896,204	SF	$3.98	$19,483,689
19	Imported Backfill	244,810	TON	$17.07	$4,178,462
21	Valves and Fittings	1	LS	$15,537,702.11	$15,537,702
22	Traffic Control	1	LS	$1,243,016.17	$1,243,016
23	Utility Relocation	1	LS	$1,553,770.21	$1,553,770
	Sub Total (Construction)				$172,592,504
	Contingencies	15%			$25,888,876
	Total (Construction)				$198,481,380
	Design and Construction Engineering	15%			$25,888,876
	Administration, Legal, and Bond Counsel	1%			$1,725,925
	Total (Professional Services)				$27,614,801
	Grand Total				**$226,096,181**
	September 2018 CCI = 11170				
	Data From Water Model Data Base				
	Costs are in 2018 dollars				
	Replacement Costs Per Year (80 Years)				**$2,826,202**

S E C T I O N

4

Chapter 4 - Impact Fee Facility Plan (IFFP)

General Background

American Fork City has experienced significant growth in recent years. This growth, through the construction of homes, parks, commercial areas, and other amenities incidental to development, has added to the load on the City's culinary water system. As development continues, additional demands will be placed on the culinary water system. American Fork City's objective is to provide adequate culinary water facilities to meet the drinking water and fire protection needs of the residents.

American Fork City adopted a Water Systems component of the General Plan in 1993, which was subsequently updated in 1998. An additional section was added to the water systems component of the General Plan in 2003, which was then updated in both 2007 and 2010 to include the proposed secondary water system. An additional update was completed in 2016. The pressurized irrigation and culinary water systems generally operate independent of each other. As such, the American Fork City Water Systems component of the General Plan are now separated into the Culinary Water and Pressurized Irrigation System master plans. The master plan update for the pressurized irrigation facilities is being completed concurrent with this master plan update. This plan proposes guidelines and suggests controls for the design and installation of culinary water facilities. The plan also establishes estimated costs associated with culinary water facilities.

Required Elements of an IFFP

The purpose of this IFFP is to identify culinary water demands placed on existing culinary water facilities by new development and propose means by which American Fork City will meet these demands. Various funding possibilities for these facilities will also be discussed.

An IFFP, or its equivalent, must be in place if impact fees are to be considered as a financing source. Impact fees are one-time fees charged to new development to cover costs of increased capital facilities necessitated by new development. They are a critical financing source for American Fork City to consider, given the growth occurring in American Fork City.

According to Utah Code Title 11 Chapter 36a, known as the Impact Fee Act, local political subdivisions with a population of 5,000 or greater must prepare a separate IFFP before imposing impact fees unless the requirements of Utah Code Ann. §11-36-301 (3) (a) are included as part of the General Plan. Because the American Fork City General Plan does not satisfy these requirements, this IFFP has been prepared to meet

the legal requirement.

Utah Code Ann. §11-36a-302 provides that the plan shall identify:

(i) Demands placed upon existing public facilities by new development activity; and

(ii) The proposed means by which the local political subdivision will meet those demands.

Demands on Existing Facilities

Service Area

American Fork City is located in the northern most portion of Utah County near the base of the Wasatch Mountains and includes an area of approximately 9.4 square miles. It is bordered on the North by Highland and Cedar Hills, on the South by Utah Lake, on the East by Pleasant Grove and Lindon, and on the West by Lehi. Existing land uses vary from pasture and farmland to high-density residential housing and commercial complexes. Therefore, the community can be classified as both rural and suburban.

American Fork City owns and operates a culinary water system that delivers culinary water and fire flow water. The existing system can be seen in Figure 7 in the appendix

Culinary Water Design Requirements

The following are the minimum level of service to be provided by the culinary water system in accordance with Utah Code Annotated, 11-36a-302(1)(a)(i) and (ii).

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Provide 20 psi at all locations in the distribution system during a fire flow event.
- Provide minimum 1,750 gpm of fire flow for 2 hours.
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 400 gallons of storage per ERC
- Maintain a minimum of 0.45 ac-ft of water right per ERC
- Maintain a minimum of 0.56 gpm of water source per ERC

Existing Culinary Water Facilities

Existing conditions at the time of this study were established using data collected from the City. Some of the data gathered and used includes an existing culinary water model, the existing water master plan, existing City maps, and field flow data. Figure 7 in the appendix shows American Fork's existing culinary water system and facilities.

Connections to the culinary water system include residential, school, church, commercial, and City owned

facility connections for a total of 13,901 ERC's.

Existing Culinary Water Source

Tables 19 and 20 describe the City's existing water sources and requirements.

Table 18 Existing Culinary Water Source Capacity

Water Source	Flowrate Capacity (gpm)	Pressure Zone
Boley Well	2,668	Upper Zone
Country Club Well	2,588	Upper Zone
Golf Course Well	2,660	Lower Zone
Hospital Well	1,400	Lower Zone
J.C. Park Well	1,500	Lower Zone
Race Track Well	3,200	Upper Zone
AF Canyon Springs	1,800	Upper Zone
Totals	**15,816**	

Table 19 Existing Culinary Water Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	7,785	15,816	8,031

American Fork City needs to meet the following criteria with regards to water source.

- Provide 800 gallons per day per indoor ERC

American Fork City currently has excess source capacity.

Existing Culinary Water Storage

Tables 21 and 22 describe the City's existing water storage facilities and requirements.

Table 20 Existing Culinary Water Storage Capacity

Tank	Capacity (gallons)	Zone*
AF Canyon Tank #1	5,000,000	Upper Zone
AF Canyon Tank #2	5,000,000	Upper Zone
Tank Farm (1 Tank)	4,500,000	Lower Zone
AF Canyon Springs Equivalent *	216,000	Upper Zone
Hospital Well Equivalent *	168,000	Lower Zone
Total	14,884,000	

*Free flowing springs or wells with backup power can be considered storage over the two hour fire flow period.

Table 21 Existing Culinary Water Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Current	5,980,400	14,884,000	8,903,600

American Fork City needs to meet the following criteria with regards to water storage.

- Provide 400 gallons of storage per indoor ERC
- Provide storage for fire flows according to International Fire Code Standards. American Fork City has determined that a minimum of 210,000 gallons per zone is required (1,750 gpm for 120 Minutes)

American Fork currently has excess storage capacity.

Existing Culinary Water Rights

Tables 22 and 23 describe the City's existing water requirements.

Table 22 Existing Culinary Water Right Capacity

Water Source	Water Right Capacity (ac-ft)	Pressure Zone
	Adequate	
Totals	**Adequate**	

Table 23 Existing Culinary Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	6,255	Adequate	Adequate

American Fork City needs to meet the following criteria with regards to water rights.

- Provide 0.45 ac-ft of water right per indoor ERC

American Fork City currently has adequate culinary water right capacity. See City 40-Year water rights plan for details on water rights.

Existing Distribution System

State of Utah Division of Drinking Water rules requires American Fork City to meet the following criteria with regards to its culinary water distribution system.

- Provide a minimum of 40 psi at all points in the distribution system during peak day demands
- Provide a minimum of 30 psi at all points in the distribution system during peak hour demands
- Provide a minimum of 20 psi at all points in the distribution system during peak day demand plus fire flows

American Fork City' existing water system meets the first two criteria but has a few areas where fire flows are limited.

Deficiencies Based on Existing Development

The following deficiencies are identified in accordance with Utah Code Annotated, 11-36a-302(1)(a)(iv). American Fork City's current culinary water system delivers culinary water and fire flow water throughout the City. There are a few areas within the City that cannot deliver the necessary fire flows. Figure 10 in the appendix shows the areas of the system that do not meet minimum pressures during fire flows. Figure 2 in the appendix shows the improvements that are recommended to correct system deficiencies. Table 24 lists the existing deficiencies in the system. A portion of the improvements listed will serve future as well as existing connections and the proportion associated with each are shown.

Table 24 Existing System Deficiencies

Item	Description	Cost	Existing	Growth
1	New 8 Inch Connections	$57,021	$24,521	$32,500.05
2	8 Inch Upsizing	$2,357,324	$1,013,725	$1,343,598.66
3	4 Inch Waterline Replacement	$16,238,007	$16,238,007	$0.00
4	Hospital Well Generator Replacement	$120,000	$120,000	$0.00
	Grand Total	**$18,772,352**	**$17,396,253**	**$1,376,099**

September 2018 CCI = 11170
Costs are in 2018 dollars

Future Demand and Capital Facilities

The following sections identify the future infrastructure required to meet the demand of new development in accordance with Utah Code Annotated, 11-36a-302(1)(a)(v).

Future Culinary Water Requirements

The same design requirements for the current system will apply for future development. All new development will be required to install a minimum of an 8-inch culinary line or the appropriate size to serve their development, whichever is larger.

Future Capital Culinary Water Facilities

Future conditions at the time of this study were established using data collected from the City. A buildout culinary water model was created with the projected culinary water system using the buildout number of ERCs. Figure 11 in the appendix shows American Fork's buildout culinary water system and facilities.

Future Culinary Water Source

American Fork City currently has approximately 15,816 gpm of culinary source capacity. Analyzing a total buildout scenario, it is projected that the City will need approximately 18,102 gpm culinary capacity. Table 25 shows American Fork's existing water sources. Table 26 gives the projected excess and deficits. American Fork City needs additional source capacity at buildout. It is recommended that the City drill two additional wells one each in the Upper and Lower Zones.

Table 25 Existing Culinary Water Source Capacity

Water Source	Flowrate Capacity (gpm)	Pressure Zone
Boley Well	2,668	Upper Zone
Country Club Well	2,588	Upper Zone
Golf Course Well	2,660	Lower Zone
Hospital Well	1,400	Lower Zone
J.C. Park Well	1,500	Lower Zone
Race Track Well	3,200	Upper Zone
AF Canyon Springs	1,800	Upper Zone
Totals	**15,816**	

Table 26 Buildout Culinary Water Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	18,102	15,816	(2,286)

Future Culinary Water Storage

American Fork City currently has approximately 14,884,000 gallons of culinary storage capacity. Analyzing a total buildout scenario, it is projected that the City will need approximately 13,350,017 gallons of culinary storage capacity. Table 27 shows American Fork's existing culinary water storage. Table 28 gives the projected excess and deficits. As a whole system it is projected that American Fork City will have adequate culinary water storage at buildout.

Table 27 Existing Culinary Water Storage Capacity

Tank	Capacity (gallons)	Zone*
AF Canyon Tank #1	5,000,000	Upper Zone
AF Canyon Tank #2	5,000,000	Upper Zone
Tank Farm (1 Tank)	4,500,000	Lower Zone
AF Canyon Springs Equivalent *	216,000	Upper Zone
Hospital Well Equivalent *	168,000	Lower Zone
Total	14,884,000	

*Free flowing springs or wells with backup power can be considered storage over the two hour fire flow period.

Table 28 Buildout Culinary Water Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Buildout	13,350,193	14,884,000	1,533,807

Future Culinary Water Right Requirements

Table 29 shows American Fork's existing culinary water rights. Table 30 gives the projected excess and deficits. It is recommended that the City continue to require water rights to be turned in to the City as a condition of development. Culinary rights that the City accepts should have a priority date of 1950 or earlier. This is based on the area water rights being over allocated. See City 40-Year water rights plan for details on water rights.

Table 29 Existing Culinary Water Right Capacity

Water Source	Water Right Capacity (ac-ft)	Pressure Zone
	Adequate	
Totals	**Adequate**	

Table 30 Buildout Culinary Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	14,546	Inadequate	Inadequate

Future Capital Facilities

Figure 11 shows the proposed culinary system layout. Table 31 shows the improvements necessary for buildout. Table 32 shows the anticipated ten year improvement schedule with associated impact fee related costs.

Table 31 Buildout System Improvements

Item	Description	Cost
1	Buildout Distribution Piping	$34,967,798
2	Buildout Transmission Piping	$26,911,944
3	Southwest Well and Generator	$4,494,252
4	North East Well and Generator	$3,682,495
	Grand Total	**$70,056,489**
	September 2018 CCI = 11170 Costs are in 2018 dollars	

Buildout connections to the culinary water system include residential, school, church, commercial, and City owned facility connections for a total of 32,325 ERC's.

Capital Facility Cost and Proportionate Share

Cost of Capital Facilities

Detailed engineer's estimates of cost are included in the appendix. A summary of those costs are included in Table 24 and 31 previously. These costs are associated with master planned improvements in order to properly handle future development demands and are thus eligible for inclusion in an impact fee. Only that portion of the capital facilities that will benefit growth in the 10 year planning period are eligible for inclusion. An appropriate inflation factor can be incorporated in the analysis to cover rising costs in the future.

Cost of Master Planning

The City expects to expend money every year to review the culinary water master plan, IFFP, and IFA and

every five years to fully update the same. These costs are eligible for inclusion in an impact fee. Only that portion of the master planning that will benefit growth in the 10 year planning period are eligible for inclusion. An appropriate inflation factor can be incorporated in the analysis to cover rising costs in the future.

Value of Free Capacity in Culinary Water System

The existing culinary water system has excess capacity or free capacity available for future growth. It is acceptable for future users to pay for their portion of the existing system through an impact fee to reimburse existing users in accordance with Utah Code Annotated, 11-36a-302(1)(a)(iii). The free capacity portion of the impact fee can be utilized to repay the exiting culinary water enterprise account to recoup actual costs spent on the original system improvements. Only actual costs can be utilized in this analysis and not current replacement costs or inflation adjusted costs.

The culinary water system has approximately 59.8 percent excess storage capacity available for future growth. See Table 21. The culinary water system has approximately 50.8 percent excess source capacity available for future growth. See Table 19. The culinary water distribution system has approximately 84.4 percent excess capacity available for future growth. This is based upon an existing system pipe length of 832,557 feet of which 146,104 feet needs to be upgraded for future growth. The remaining feet of pipe has the necessary capacity for future growth.

Cost Associated with Existing Deficiencies

As described previously, the existing culinary water system has deficiencies but these are not associated with future connections and cannot be included in an impact fee analysis (IFA). Some existing system deficiency improvements will serve the needs of buildout as well as cure an existing deficiency. These costs can be included in an impact fee and the portion of that cost is identified in Table 24.

Developer Contributions

As growth occurs throughout the City, developers are required to install minimum size culinary water lines to serve the homes within their development. Sometimes lines throughout the City need to be upsized to accommodate homes outside the development. The City collects impact fees from all development to cover the cost of upsizing. The detailed cost estimates prepared in the Master Plan only include those costs related to upsizing developer provided facilities or wholly City constructed facilities. No impact fees can be collected for developer provided facilities.

10 Year Improvement Schedule

Table 32 provides the anticipated schedule for master planning and improvement construction. The costs represent present value in 2018 dollars.

Table 32 10 Year Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2018-19	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	New 8 Inch Connections	$57,021	43.00%	$32,500	$24,521
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,483,103	0.00%	$1,483,103	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2019-20	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,483,103	0.00%	$1,483,103	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2020-21	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Southwest Well and Generator	$1,528,046	0.00%	$1,528,046	$0
	Buildout Distribution Piping	$1,748,390	0.00%	$1,748,390	$0
2021-22	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	Hospital Well Generator Replacement	$120,000	100.00%	$0	$120,000
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2022-23	5 Year Master Plan Update	$40,000	43.00%	$22,799	$17,201
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2023-24	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0

2024-25	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2025-26	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2026-27	Annual Master Plan Review	$4,000	43.00%	$2,280	$1,720
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
2027-28	5 Year Master Plan Update	$40,000	43.00%	$22,799	$17,201
	8 Inch Upsizing	$235,732	43.00%	$134,360	$101,373
	4 Inch Waterline Replacement	$1,623,801	100.00%	$0	$1,623,801
	System Replacement	$966,669	100.00%	$0	$966,669
	Buildout Distribution Piping	$1,100,838	0.00%	$1,100,838	$0
	Buildout Transmission Piping	$996,739	0.00%	$996,739	$0
	Total Expenditures	**$52,973,503**		**$25,862,394**	**$27,111,108**

Revenue Source to Finance System Improvements

The following revenue sources to finance impact on system improvements are identified in accordance with Utah Code Annotated, 11-36a-302(2).

General Fund Revenues

While general fund revenues can be used to fund capital facilities, they are generally insufficient to meet the demands of large infrastructure projects. General fund revenues are mainly drawn from property, sales, and franchise tax revenues.

Grants and Donations

Grants monies or low interest loans for capital facilities may be available through a variety of state and federal programs. Competition for these types of funds is often strong, but they should not be overlooked as a potential funding source.

Culinary Water Utility

Most municipalities have enacted a culinary water utility to pay the cost of capital facilities. A culinary water utility would charge all residents a monthly fee based on water usage. Monthly fees could then be used to maintain the system and/or construct capital facility improvements.

Impact Fees

Impact fees are an important means of financing future culinary water capital facility improvements, especially given the growth American Fork City is experiencing. The fees collected can be used for infrastructure as outlined in this IFFP. Impact fees are a one-time fee charged to new development that allow development to "pay its own way" in terms of the additional costs cities experience when growth occurs. Impact fees must meet the requirements of Utah law, must demonstrate that there is a rational connection between the fees charged to correct deficiencies in an existing system, and must provide that adjustment to impact fees be made to appropriately credit any significant past payments or anticipated future payments to capital facilities. This is to insure that the new development is not "double charged" for capital facilities. Impact fees are necessary in order to achieve an equitable allocation between the costs borne in the past and the cost to be borne in the future. Existing residential and businesses are well served by the existing culinary water system. However, with additional growth improvements and expansion of the culinary water system will be needed to provide adequate service.

Debt Financing

American Fork City can also fund culinary water facilities through bonding. Bonding is often a good approach when large sums are needed up-front because it allows the payments to be spread over a longer time period. American Fork City does have a revenue source in culinary water user rates to back a debt service payment for culinary water system improvements. Bonding can be obtained on the open market or through governmental agencies such as the Utah Division of Drinking Water.

IFFP Certification

I certify that the attached impact fee facility plan (IFFP):

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. offset costs with grants or other alternate sources of payment; and
4. complies in each and every relevant respect with the Impact Fees Act.

This certification made in accordance with Utah Code Annotated, 11-36a-306(1), with the following caveats:

1. All of the recommendations for implementation of the IFFP made in the IFFP are followed in their entirety by American Fork City staff and Council in accordance to the specific policies established for the service area.
2. If all or a portion of the IFFP are modified or amended, this certification is no longer valid.
3. All information provided to Horrocks Engineers, its contractors or suppliers is assumed to be correct, complete and accurate. This includes information provided by American Fork City and outside sources.

Date _____

John E. Schiess, P.E.
Digitally signed by John E. Schiess, P.E.
DN: C=US, E=jschiess@horrocks.com, O=Horrocks Engineers, OU=Principal, CN="John E. Schiess, P.E."
Date: 2019.02.11 11:57:12-07'00'
_____

John E. Schiess, P.E.
Horrocks Engineers

APPENDIX

Legend

Improvement

- 8 Inch Rehab
- 8 Inch Upsize
- American Fork
- Parcels
- Roads

1:24,000

Culinary Water System Master Plan

Existing Culinary Water System Improvements

HORROCKS
50 ANNIVERSARY 1968-2018
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

DATE 9/12/2018
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Figure 2

Legend

Pump

- New Southwest Well
- New Northeast Well

Improvement

- 8 Inch New
- 8 Inch Upsize
- 10 Inch New
- 12 Inch New
- 12 Inch Upsize
- 16 Inch New
- 20 Inch New
- 24 Inch Upsize
- 30 Inch New
- 30 Inch Upsize
- 36 Inch Upsize
- American Fork
- Parcels
- Roads

1:24,000

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Culinary Water System Master Plan

Buildout Culinary Water System Improvements

DATE 2/11/2019

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Figure 3

Legend

American Fork
Parcels
Roads

Zoning

CC-1
CC-2
GC-1
GC-2
I-1
M-1
PC
PF
PI-1
PO-1
PR-2.0
PR-2.3
PR-3.0
R1-12000
R1-15000
R1-20000
R1-7500
R1-9000
R2-7500
R3-7500
R4-7500
RA-1
RA-5
S-1
SC-1
SP
TOD

1:24,000

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Culinary Water System Master Plan

Existing Zoning

DATE 9/12/2018
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Figure 4

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Legend

- American Fork
- Parcels
- Roads
- professional office
- Design Commercial
- Design Industrial
- General Commercial
- Institutional Lands, Schools and Public Facilities
- Low Density Residential
- Major Transportation Facilities
- Neighborhood Commercial
- Planned Community
- Professional Office
- Public Parks & Open Space
- Residential High Density
- Residential Low Density
- Residential Medium Density
- Residential Very- Low Density
- Resort
- Shoreline Protection
- Transit Oriented Development

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Culinary Water System Master Plan

General Plan Anticipated Land Use

DATE 9/12/2018
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Figure 5

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Legend

pipes

Pipe Diameter

- 2-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 14-inch
- 16-inch
- 18-inch
- 20
- 22-inch
- 24-inch

- Spring

Pump

- Well - Boley
- Well - Country Club
- Well - Golf Course
- Well - Hospital
- Well - JC Park
- Well - Race Track

Tank

- Tank - AF Canyon
- Tank - Tank Farm
- PRV
- Junctions
- American Fork
- Parcels
- Roads

1:30,000

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Culinary Water System Master Plan

Existing Culinary Water System

DATE 9/12/2018
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Figure 6

Legend

- American Fork
- lower
- upper
- Roads

1:24,000

Culinary Water System Master Plan

Existing Culinary Water Pressure Zones

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DATE: 9/12/2018
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Figure 7

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Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

1:24,000

Culinary Water System Master Plan

Existing Peak Day Pressures

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Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

DATE 2/11/2019

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Figure 8

Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

1:24,000

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Culinary Water System Master Plan

Existing Peak Day Velocity

DATE 9/12/2018

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Figure 9

Legend

pipes

pipes

fire flow

Avalable Fire Flow

- 0-1000 gpm
- 1000-1750 gpm
- 1750-2000 gpm
- 2000-3000 gpm
- 3000-7500 gpm

American Fork

Parcels

Roads

1:24,000

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Culinary Water System Master Plan

Existing Fire Flow Avaliable

DATE 9/12/2018

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Figure 10

Legend

pipes

Pipe Diameter

- 2-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 14-inch
- 16-inch
- 18-inch
- 20
- 22-inch
- 24-inch
- 30
- 36

- Spring

Pump

- Well - South
- Well - Warnick
- Well - Boley
- Well - Country Club
- Well - Golf Course
- Well - Hospital
- Well - JC Park
- Well - Race Track

Tank

- Tank - AF Canyon
- Tank - Tank Farm
- PRV
- Junctions
- American Fork
- Parcels
- Roads

1:30,000

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Culinary Water System Master Plan

Buildout Culinary Water System

DATE 9/12/2018
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Figure 11

Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

1:24,000

Culinary Water System Master Plan

Buildout Peak Day Pressures

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Pleasant Grove, UT 84062
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Figure 12

Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

1:24,000

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Suite 400
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Culinary Water System Master Plan

Buildout Peak Day Velocity

DATE 9/12/2018

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Figure 13

Legend

pipes

pipes

fire flow

Avalable Fire Flow

- 0-1000 gpm
- 1000-1750 gpm
- 1750-2000 gpm
- 2000-3000 gpm
- 3000-7500 gpm

American Fork

Parcels

Roads

1:24,000

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Culinary Water System Master Plan

Buildout Fire Flow Avaliable

DATE 9/12/2018

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Figure 14

Table 33 Detailed Cost Estimates

New 8 Inch Connections

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$2,073
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	316	LF	$64.18	$20,280
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	0	LF	$117.66	$0
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	0	LF	$192.53	$0
12	Fire Hydrants	1	EA	$6,029.25	$6,029
13	Service Connections	0	EA	$1,705.74	$0
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	1,896	SF	$3.98	$7,545
19	Imported Backfill	95	TON	$17.07	$1,618
21	Valves and Fittings	1	LS	$5,069.98	$5,070
22	Traffic Control	1	LS	$405.60	$406
23	Utility Relocation	1	LS	$507.00	$507
	Sub Total (Construction)				$43,527
	Contingencies	15%			$6,529
	Total (Construction)				$50,056
	Design and Construction Engineering	15%			$6,529
	Administration, Legal, and Bond Counsel	1%			$435
	Total (Professional Services)				$6,964
	Grand Total				**$57,021**
	September 2018 CCI = 11170				
	Costs are in 2018 dollars				
	Cost to Existing Users	43.00%			$24,520.81
	Cost to Future Users	57.00%			$32,500.05

Project is needed to fix existing deficiency but will be utilized by future growth as well.

8 Inch Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$85,690
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	10,731	LF	$64.18	$688,683
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	0	LF	$117.66	$0
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	0	LF	$192.53	$0
12	Fire Hydrants	24	EA	$6,029.25	$144,702
13	Service Connections	215	EA	$1,705.74	$366,086
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	64,386	SF	$3.98	$256,214
19	Imported Backfill	3,219	TON	$17.07	$54,948
21	Valves and Fittings	1	LS	$172,170.74	$172,171
22	Traffic Control	1	LS	$13,773.66	$13,774
23	Utility Relocation	1	LS	$17,217.07	$17,217
	Sub Total (Construction)				$1,799,484
	Contingencies	15%			$269,923
	Total (Construction)				$2,069,407
	Design and Construction Engineering	15%			$269,923
	Administration, Legal, and Bond Counsel	1%			$17,995
	Total (Professional Services)				$287,917
	Grand Total				**$2,357,324**
	September 2018 CCI = 11170				
	Costs are in 2018 dollars				
	Cost to Existing Users	43.00%			$1,013,725.36
	Cost to Future Users	57.00%			$1,343,598.66

Project is needed to fix existing deficiency but will be utilized by future growth as well.

4 Inch Waterline Replacement

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$590,258
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	73,973	LF	$64.18	$4,747,362
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	0	LF	$117.66	$0
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	0	LF	$192.53	$0
12	Fire Hydrants	164	EA	$6,029.25	$988,796
13	Service Connections	1,479	EA	$1,705.74	$2,523,576
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	443,838	SF	$3.98	$1,766,185
19	Imported Backfill	22,192	TON	$17.07	$378,775
21	Valves and Fittings	1	LS	$1,186,840.58	$1,186,841
22	Traffic Control	1	LS	$94,947.25	$94,947
23	Utility Relocation	1	LS	$118,684.06	$118,684
	Sub Total (Construction)				$12,395,425
	Contingencies	15%			$1,859,314
	Total (Construction)				$14,254,739
	Design and Construction Engineering	15%			$1,859,314
	Administration, Legal, and Bond Counsel	1%			$123,954
	Total (Professional Services)				$1,983,268
	Grand Total				**$16,238,007**

September 2018 CCI = 11170
Costs are in 2018 dollars

Buildout Distribution Piping

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,271,094
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	1,484	LF	$64.18	$95,239
5	10 inch DIP	4,874	LF	$69.53	$338,865
6	12 inch DIP	70,122	LF	$80.22	$5,625,271
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	51,216	LF	$117.66	$6,025,960
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	0	LF	$192.53	$0
12	Fire Hydrants	284	EA	$6,029.25	$1,712,306
13	Service Connections	2,554	EA	$1,705.74	$4,356,327
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	766,176	SF	$3.98	$3,048,879
19	Imported Backfill	38,309	TON	$17.07	$653,861
21	Valves and Fittings	1	LS	$3,021,333.65	$3,021,334
22	Traffic Control	1	LS	$241,706.69	$241,707
23	Utility Relocation	1	LS	$302,133.36	$302,133
	Sub Total (Construction)				$26,692,976
	Contingencies	15%			$4,003,946
	Total (Construction)				$30,696,922
	Design and Construction Engineering	15%			$4,003,946
	Administration, Legal, and Bond Counsel	1%			$266,930
	Total (Professional Services)				$4,270,876
	Grand Total				**$34,967,798**

September 2018 CCI = 11170

Costs are in 2018 dollars

Buildout Transmission Piping

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$978,260
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	0	LF	$64.18	$0
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	20 inch DIP	0	LF	$192.53	$0
8	24 inch DIP	4,402	LF	$256.71	$1,130,028
9	30 inch DIP	12,991	LF	$320.88	$4,168,614
10	36 inch DIP	18,094	LF	$385.06	$6,967,308
12	Fire Hydrants	79	EA	$6,029.25	$476,310
13	Service Connections	710	EA	$1,705.74	$1,210,633
13	42 inch Boring (railroads)	400	LF	$1,000.00	$400,000
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	354,870	SF	$3.98	$1,412,150
19	Imported Backfill	10,646	TON	$17.07	$181,709
21	Valves and Fittings	1	LS	$3,066,487.49	$3,066,487
22	Traffic Control	1	LS	$245,319.00	$245,319
23	Utility Relocation	1	LS	$306,648.75	$306,649
	Sub Total (Construction)				$20,543,469
	Contingencies	15%			$3,081,520
	Total (Construction)				$23,624,989
	Design and Construction Engineering	15%			$3,081,520
	Administration, Legal, and Bond Counsel	1%			$205,435
	Total (Professional Services)				$3,286,955
	Grand Total				**$26,911,944**

September 2018 CCI = 11170

Costs are in 2018 dollars

Southwest Well and Generator

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$163,368
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	0	LF	$64.18	$0
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	0	LF	$117.66	$0
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	400	LF	$192.53	$77,012
12	Fire Hydrants	1	EA	$6,029.25	$6,029
13	Service Connections	0	EA	$1,705.74	$0
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	1	EA	$3,150,000.00	$3,150,000
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	2,400	SF	$3.98	$9,550
19	Imported Backfill	120	TON	$17.07	$2,048
21	Valves and Fittings	1	LS	$19,253.09	$19,253
22	Traffic Control	1	LS	$1,540.25	$1,540
23	Utility Relocation	1	LS	$1,925.31	$1,925
	Sub Total (Construction)				$3,430,727
	Contingencies	15%			$514,609
	Total (Construction)				$3,945,336
	Design and Construction Engineering	15%			$514,609
	Administration, Legal, and Bond Counsel	1%			$34,307
	Total (Professional Services)				$548,916
	Grand Total				**$4,494,252**

September 2018 CCI = 11170

Costs are in 2018 dollars

North East Well and Generator

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$133,860
2	4 inch DIP	0	LF	$64.18	$0
3	6 inch DIP	0	LF	$64.18	$0
4	8 inch DIP	0	LF	$64.18	$0
5	10 inch DIP	0	LF	$69.53	$0
6	12 inch DIP	0	LF	$80.22	$0
7	14 inch DIP	0	LF	$96.27	$0
8	16 inch DIP	150	LF	$117.66	$17,649
9	18 inch DIP	0	LF	$149.75	$0
10	20 inch DIP	0	LF	$192.53	$0
12	Fire Hydrants	0	EA	$6,029.25	$0
13	Service Connections	0	EA	$1,705.74	$0
13	PRV Stations	0	EA	$73,943.78	$0
13	Water Supply Wells	1	EA	$2,650,000.00	$2,650,000
13	Spring Collection System	0	EA	$427,846.40	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$995,409.72	$0
17	Class "A" Road Repair	900	SF	$3.98	$3,581
19	Imported Backfill	45	TON	$17.07	$768
21	Valves and Fittings	1	LS	$4,412.17	$4,412
22	Traffic Control	1	LS	$352.97	$353
23	Utility Relocation	1	LS	$441.22	$441
	Sub Total (Construction)				$2,811,065
	Contingencies	15%			$421,660
	Total (Construction)				$3,232,724
	Design and Construction Engineering	15%			$421,660
	Administration, Legal, and Bond Counsel	1%			$28,111
	Total (Professional Services)				$449,770
	Grand Total				**$3,682,495**

September 2018 CCI = 11170

Costs are in 2018 dollars

Table 34 Zone By Zone Needs Analysis

American Fork City

WATER SYSTEM ANALYSIS

Low Zone Culinary

System User Analysis	
Existing ERC	11,388.0
Existing Irrigation ERC	0.0
Projected ERC	28,569.0
Projected Irrigation ERC	0.0
Existing System Capacities	
Water Right (gpm)	0.0
Water Source (gpm)	14,420
Water Storage (gallons)	13,531,200

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Water Right	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (ac-ft)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,388.0		400	gal/day/conn	5102.83		
Existing Outdoor Need		0	1.66	ac-ft/irr ac	0.00		
Existing Total WR Need					5102.83	(1,125.60)	(6228.42)
Projected Indoor Need	28,569.0		400	gal/day/conn	12801.43		
Projected Outdoor Need		0	1.66	ac-ft/season	0.00		
Projected Total WR Need					12801.43	(1,682.57)	(14484.00)

Water Source	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gpm)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,388.0		800	gal/day/conn	6327.00		
Existing Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Existing Total WS Need					6327.00	14,420.00	8,093.00
Projected Indoor Need	28,569.0		800	gal/day/conn	15872.00		
Projected Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Projected Total WS Need					15872.00	18,730.00	2,858.00

JC Park Well	1,500.00
Hospital Well	1,400.00
Golf Course Well	2,660.00
Upstream Extra Capacity	8,860.00
Total	**14,420.00**
Total From Existing	5,560.00
Patriot Well	3,000.00
Upstream Extra Capacity	10,170.00
Total	**18,730.00**

Water Storage	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gal)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,388.0		400	gal/conn	4,555,200		
Existing Outdoor Need		0	3168	gal/irr-acre	-		
Fire Protection			2,000	gpm*120min	240,000		
Existing Total Storage Need					4,795,200	13,531,200	8,736,000
Projected Indoor Need	28,569.0		400	gal/conn	11,427,600		
Projected Outdoor Need		0	3168	gal/irr-acre	-		
20% Emergency Storage			20%		2,285,520		
Fire Protection			2000	gpm*120min	240,000		
Projected Total Storage Need					13,953,120	14,871,600	918,480

Lower Tanks	4,500,000.00
Upstream Extra Capacity	9,031,200.00
Total	**13,531,200.00**
Patriot Tank	2,000,000.00
Hospital Well Equivalent	168,000.00
Lower Tanks	4,500,000.00
Upstream Extra Capacity	8,203,600.00
Total	**14,871,600.00**

System User Analysis	
Existing ERC	2,512.0
Existing Irrigation ERC	0.0
Projected ERC	3,755.0
Projected Irrigation ERC	0.0
Existing System Capacities	
Water Right (gpm)	0
Water Source (gpm)	10,256
Water Storage (gallons)	10,216,000

American Fork City

WATER SYSTEM ANALYSIS

High Zone Culinary

Water Right	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (ac-ft)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,512.0		400	gal/day/conn	1125.60		
Existing Outdoor Need		0	1.66	ac-ft/irr ac	0.00		
Existing Total WR Need					1125.60	0.00	(1125.60)
Projected Indoor Need	3,755.0		400	gal/day/conn	1682.57		
Projected Outdoor Need		0	1.66	ac-ft/season	0.00		
Projected Total WR Need					1682.57	0.00	(1682.57)

Water Source	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gpm)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,512.0		800	gal/day/conn	1396.00		
Existing Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Existing Total WS Need					1396.00	10,256.00	8,860.00
Projected Indoor Need	3,755.0		800	gal/day/conn	2086.00		
Projected Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Projected Total WS Need					2086.00	12,256.00	10,170.00

Race Track Well	3,200.00
Boley Well	2,668.00
Country Club Well	2,588.00
AF Cannyon Springs	1,800.00
Total	**10,256.00**
Total From Existing	10,256.00
Warnick Well	2,000.00
Total	**12,256.00**

Water Storage	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gal)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,512.0		400	gal/conn	1,004,800		
Existing Outdoor Need		0	3168	gal/irr-acre	-		
Fire Protection			1,500	gpm*120min	180,000		
Existing Total Storage Need					1,184,800	10,216,000	9,031,200
Projected Indoor Need	3,755.0		400	gal/conn	1,502,000		
Projected Outdoor Need		0	3168	gal/irr-acre	-		
20% Emergency Storage			20%		300,400		
Fire Protection			1750	gpm*120min	210,000		
Projected Total Storage Need					2,012,400	10,216,000	8,203,600

AF Canyon Srpings Equiv	216,000.00
Upper Tanks	10,000,000.00
Total	**10,216,000.00**

AF Canyon Srpings Equiv	216,000.00
Upper Tanks	10,000,000.00
Total	**10,216,000.00**